

Remarks

The examiner's reconsideration of the application is requested in view of the amendments above and comments which follow. Since claims 2 through 5 and 11 through 24 remain in the application (but have been withdrawn from consideration), those claims remain above with the "withdrawn" identification.

In the office action, the examiner now rejects claims 1, 7, 8 and 10 under 35 U.S.C. §102 as being anticipated by Chi U.S. Patent Number 5,608,243. Claims 6 and 9 have been further rejected by the examiner under 35 U.S.C. §103 as being obvious over Chi in view of Takemoto U.S. Patent Number 4, 148,048. Reconsideration is requested.

The Examiner alleges that Chi anticipates claim 1 of the present invention by mentioning each and all of the features of claim 1. The applicant respectfully submits that this is not true: in Chi the carrier transport pathway stores carriers, which is contrary to the present invention.

Nevertheless, with the sole purpose to clarify this, an amended claim 1 is filed herewith. Claim 1 now clarifies that the carrier transport pathway goes from or through the region in the substrate for collecting but not storing carriers (carrier collection region), to the at least one doped or inverted region.

According to the present invention, no carrier storing takes place between the collection region and the doped or inverted region where charges are collected for readout (page 3 lines 21-23). Charges are not stored in the transport pathway. This is stated in the description page 3 lines 20-25: "... free carriers are generated. These are not stored in the substrate." This is also explicitly stated in claim 1.

According to Chi, photons strike the surface of p+ region 114 and, as a result, create a number of electron-hole pairs (col. 3 lines 55-59). The p+ region 114 in Chi corresponds to the radiation sensitive source of carriers in the substrate in the present invention. The junction

between p+ region 114 and drain region 108 in Chi forms a photo-diode for collecting image charges (col. 3 lines 50-52). This junction corresponds to the region in the substrate for collecting but not storing charge carriers in the present invention. The generated electrons are then swept to the drain region 108 (col. 3 lines 61-67), which raises the potential of the floating gate 116 (col. 3 lines 63-64). The electrons are stored in the drain region 108. After the integration period has ended, a positive read voltage V_{read} is applied to control gate 118, which induces formation of a conductive channel on the top surface of the channel region 112 of the substrate 110. This conductive channel allows a current to flow from the drain region 108 to the source region 106 (col. 4 lines 7-14). The source region 106 corresponds to the doped or inverted region of a first conductivity in the substrate of the present invention. The channel region 112 corresponds to the carrier transport pathway from or through the region for collecting but not storing carriers to the doped or inverted region in the present invention.

As can be seen from the above description of Chi, charges are stored in between the "region for collecting but not storing the carriers" (p+ region 114) and the "doped or inverted region" (source 106), more particularly they are stored in the planar current flow, carrier transport pathway, where a second portion 112B of the channel region 112 is only made conductive after the integration period in order to allow charges stored in a first portion 112A of the channel region 112 to flow to the source 106 for read out. This is what typically happens with CCD devices, and this is contrary to the present invention, where it is explicitly stated in claim 1 that carriers are not stored in the carrier transport pathway.

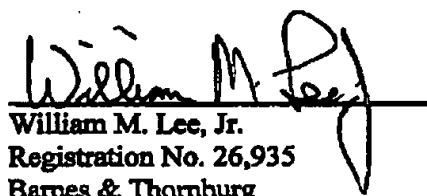
So the fact that, according to the present invention, charges are not stored in the carrier transport pathway is the feature which distinguishes the present invention over Chi. This has the advantage that, by using non-carrier storing mechanisms and transport pathways, the complete collected charge is transferred to a region for readout, which makes the sensor more sensitive than prior art sensors.

In view of the above, amended claim 1 is considered to be novel and nonobvious, and thus patentable, over Chi. As claims 6 to 10 are dependent on claim 1, they are considered to be patentable over Chi as well.

The examiner's reconsideration of the application is therefore urged, as well as reconsideration of the withdrawn claims. Given the above, it is submitted that the application is now in condition for allowance, and the examiner's further and favorable reconsideration in that regard is urged.

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Respectfully submitted,


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